

Keysight Technologies

Optimize Your Mobile Device's Subcircuits for Battery Run Time

Technical Overview

Measure and analyze power consumption and control of subcircuits to gain greater insights for optimizing your mobile device's battery run time.

Just as it is necessary to measure and analyze your mobile device's overall power consumption for optimizing battery run time, you also need to measure and analyze your device's subcircuits. Often, you will want to do this in conjunction with the overall power consumption to gain further insight on their relationship. Examples of measuring and analyzing a mobile device's subcircuits include:

- Display illumination power in relation to the contrast and color controls
- Baseband microcontroller voltage and current in relation to its operating state and clock rate when voltage-frequency scaling is used
- RF power amplifier current and voltage in relation to RF transmit power, with additional consideration when dynamic voltage control is used
- Powering on individual subcircuits at the appropriate time for specified operations

All the various subcircuits are most always powered by the power management unit (PMU). The PMU provides independent, regulated bias voltages to each of the subcircuits so they can be individually turned on or off, or their power can be adjusted as needed for power management purposes. Because of this arrangement, it is usually necessary to measure the respective voltage and current powering a subcircuit instead of directly powering it with an external DC source during test.

Measuring subcircuit power consumption requires high-performance, non-invasive measurement logging.

Figure 1 depicts a representative setup for measuring battery input and a subcircuit voltage and current using conventional data acquisition equipment. High-speed digitization of the current is essential, as it provides many detailed insights about activities. Accurate measurement over an extended dynamic range is also essential for obtaining meaningful results because of the wide dynamic operating range and high peak pulse current drains typical of mobile devices and their subcircuits. Individual subcircuits often have much lower minimum currents and therefore may need even greater dynamic measurement range than the overall device needs. The wide-ranging current drain consumes the instrumentation's dynamic measurement range, limiting achievable accuracy.

This becomes even more problematic when you consider the current shunt peak voltage drop should be kept below 50 mV so it does not affect the subcircuit and test results. It is imperative the instrumentation has sufficient gain, dynamic range and accuracy for good results. Conventional data acquisition equipment usually falls short of meeting these requirements.

Additional independent measurement channels are also needed to log the battery and subcircuit voltages simultaneously with their currents. Together they provide the key insights necessary for measuring and analyzing the battery input and subcircuits and PMU control activities of your device.

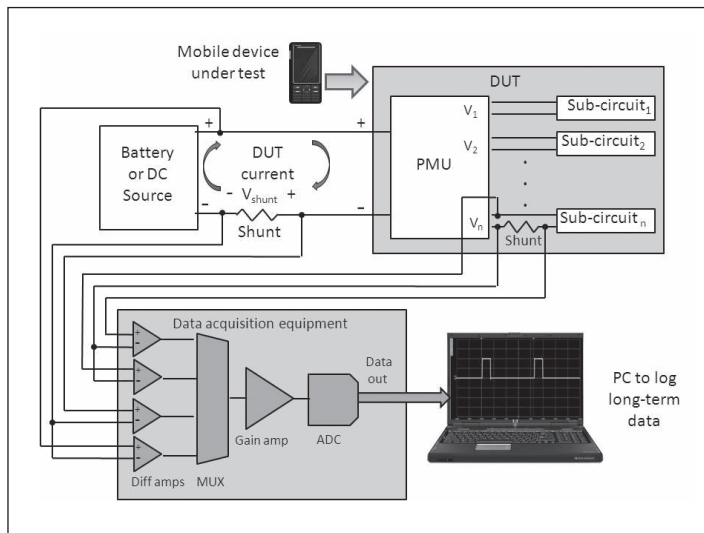


Figure 1. Conventional battery input and subcircuit power test setup

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